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(54) **COOKING APPLIANCE AND METHOD FOR OPERATING A COOKING APPLIANCE**

(57) The present application is concerned with a cooking appliance comprising:

- a plurality of cooking zones (12; 28, 30);
- means for detecting whether cookware is present in the cooking zones; and
- a user interface (14) for setting a power level for each of the cooking zones (12; 28, 30), and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone.

In accordance with one aspect of the present appli-

cation the cooking appliance is configured to detect upon power-up of the cooking appliance whether cookware is present in the cooking zones (12; 28, 30), and if it is detected that cookware is present in at least two adjacent cooking zones, the user interface (14) presents input means for individually selecting a power level for each of the adjacent cooking zones, and further presents input means for selecting a bridging mode for operating adjacent cooking zones as a combined cooking zone.

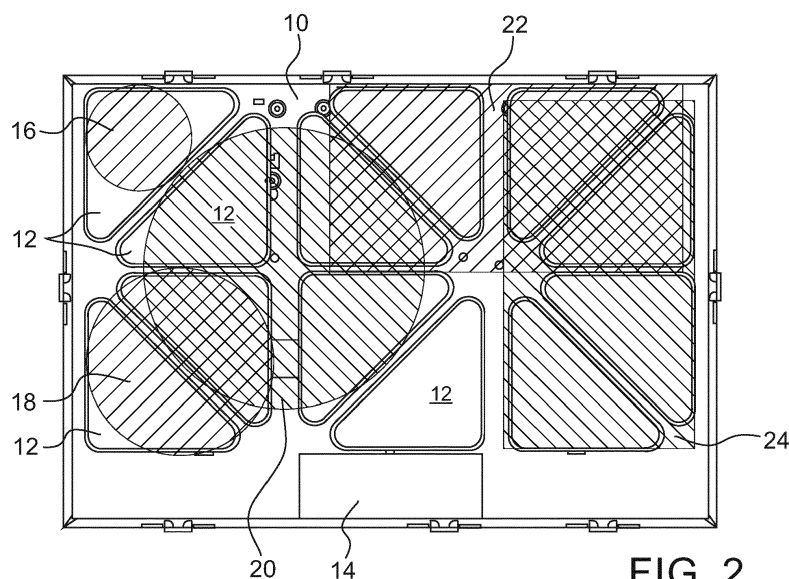


FIG. 2

Description

[0001] The present invention relates to a cooking appliance, particularly a cooking hob, more particularly an induction hob, which comprises a plurality of cooking zones, means for detecting whether cookware is present in the cooking zones, and a user interface for setting a power level for each of the cooking zones and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone.

[0002] Such a cooking appliance is shown in WO 2008/122495 A1, which discloses an induction hob having a plurality of induction coils that are located below a glass ceramic plate. Based on a detection of cookware placed on the induction coils, a plurality of induction coils can be operated as a combined cooking zone.

[0003] A further such cooking appliance is shown in EP 2 840 867 A1, wherein in case that cookware is detected to be present in adjacent cooking zones, these cooking zones automatically are operated as a combined cooking zone. There are various situations in which the strategy of operating a cooking appliance suggested in EP 2 840 867 A1 is disadvantageous. Thus, when heating a first cookware item, such as a pot or a casserole, on one or more cooking zones and then setting a second cookware item onto an adjacent cooking zone, such adjacent cooking zone will automatically be heated to the same power level as that used for heating the first cookware item. Unless such heating level coincidentally corresponds to the power level that the users wishes to use for heating the second cookware item, the user has to reset the entire hob and has to set anew the power levels for all cooking zones to be used.

[0004] In view of the above, there is room for improvement. Therefore, it is an object of the present invention to provide for a cooking appliance of the afore-mentioned type, and for a method of operating such a cooking appliance, which provide for improved user friendliness.

[0005] The above object is solved by cooking appliances as they are defined in claims 1 and 4 and by methods for operating a cooking appliance as they are defined in claims 13 and 16.

[0006] In particular, the present invention is directed to a cooking appliance, particularly a cooking hob, more particularly an induction hob, which comprises a plurality of cooking zones, means for detecting whether cookware is present in the cooking zones, and at least one user interface for setting a power level for each of the cooking zones and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone.

[0007] In accordance with a first aspect of the present invention the cooking appliance is configured to detect upon power-up of the cooking appliance whether cookware is present in the cooking zones, and if it is detected that cookware is present in at least two adjacent cooking zones, the user interface presents input means for individually selecting a power level for each of the adjacent

cooking zones, and further presents input means for selecting a bridging mode for operating adjacent cooking zones as a combined cooking zone.

[0008] As used in the present disclosure, the term "cooking zone" designates a zone to which heat can be applied, which zone can be formed by a single heating element, such as a single induction coil, or which is formed by two or more heating elements, which can be operated simultaneously, but which also may be operated individually so as to adapt the size and shape of the cooking zone to the size and shape of a cookware item to be heated in such cooking zone. Additionally or alternatively, the term "cooking zone" as used in the present disclosure, preferably refers to a zone to which heat can be applied, which zone can be formed by a single heating element, such as a single induction coil, or which is formed by two or more heating elements, which are operatively connected to be operated with the same heating power density, so as to adapt the size and shape of the cooking zone to the size and shape of a cookware item to be heated in such cooking zone.

[0009] Thus, if in the process of detecting whether cookware is present in the cooking zones it is detected that cookware is present, for example, in three adjacent cooking zones A, B and C, the user interface presents input means for individually selecting a power level for each of the adjacent cooking zones A, B and C, but further will present input means for selecting a bridging mode for operating either adjacent zones A and B in bridging mode, or for operating adjacent zones B and C in bridging mode, or for operating all three adjacent zones A, B and C in bridging mode.

[0010] Similarly, if it is detected that cookware is present in four adjacent cooking zones A, B, C and D, the user interface may present input means for selecting a bridging mode of all four adjacent cooking zones A, B, C and D, of adjacent zones A, B and C, of adjacent zones B, C and D, of adjacent zones A and B, of adjacent zones B and C, of adjacent zones C and D, or finally for providing two simultaneous bridging modes in which zones A and B are operated as a first combined zone and zones C and D are operated as a second combined zone.

[0011] In this embodiment of the cooking appliance suggested herein, upon power-up of the appliance a detection is made of cookware items that are placed on the cooking zones. If in such detection it is determined that cookware is present in at least two adjacent cooking zones, as a default selection the respective cooking zones are presented as cooking zones that are to be operated individually, wherein however an additional input means is presented by which a bridging mode can be selected to operate any or all of the adjacent cooking zones as a combined cooking zone.

[0012] Thus, while the cooking appliance automatically detects in which of the cooking zones cookware is present and thus presents respective input means for individually selecting a power level for each of the adjacent cooking zones, should the user wish to operate any

of the adjacent cooking zones as a combined cooking zone, this can be easily effected by making a respective selection at the input means by which a bridging mode can be selected. To operate any of the adjacent cooking zones as a combined cooking zone, the user thus has to manually confirm that such combined operation of adjacent cooking zones is intended. If the bridging mode is selected, the selected two or more cooking zones then are dealt with as one larger single zone, so that all the cooking zones that constitute the combined zone are operated using a single set of operating parameters, i.e. are operated at the same power level and, should optional timer functions be set, with the same timer functions.

[0013] In preferred embodiments, the cooking appliance is configured to operate the user interface such that upon selection of a bridging mode of adjacent cooking zones, the input means for individually selecting a power level for each of the adjacent cooking zones that now are operated in bridging mode are hidden, and input means for selecting a power level of the combined cooking zone is presented. In this manner the bridging mode of operation of adjacent cooking zones also is reflected in the choice of input elements offered by the user interface, which provides for a clear and user friendly presentation of the respective input elements.

[0014] Similarly, the cooking appliance further can be configured to operate the user interface such that upon selection of a bridging mode of adjacent cooking zones, the input means for selecting a bridging mode is hidden for those cooking zones for which a bridging mode has been selected. Thus, the user interface preferably is adapted to only offer options that can be selected by the user, whereas presently unavailable options are hidden, which further improves the practicability of the appliance by providing for a clear and self-explaining choice of input elements and displays.

[0015] In accordance with a second aspect of the present invention, the above object further is solved by a cooking appliance as it is defined in claim 4, wherein the cooking appliance is configured to detect during operation of the cooking appliance when cookware is placed onto at least two adjacent cooking zones, wherein based on the temporal relationship of the placement of cookware onto adjacent cooking zones a decision is made whether the cooking zones are to be operated individually or are to be operated in a bridging mode as a combined cooking zone. Considering that when processing more than one cookware item at the same time, it is rather unlikely that these items are simultaneously placed onto the cooking appliance, in case that it is determined that adjacent cooking zones are covered by cookware items either simultaneously or in close timely relationship it is assumed that these cooking zones are to be operated in a bridging mode. Thus, while when placing a larger cookware item, such as a lengthy casserole, onto the cooking surface such that it covers more than one cooking zone, this will be done either by lowering the cookware

item from above onto the cooking surface, in which case there will be detected a simultaneous placing of cookware in the respective cooking zones, or by shifting the cookware item along the cooking surface until the intended cooking zones are covered, in which case the setting of cookware onto the respective cooking zones will be detected shortly after each other. Determining the temporal relationship of the placement of cookware onto the adjacent cooking zones thus provides for a means for detecting larger cookware items with a high level of probability. By determining the temporal relationship of the placement of cookware, the cooking appliance thus can provide with high accuracy for a reliable decision whether the cooking zones are to be operated individually or are to be operated in a bridging mode as a combined cooking zone.

[0016] It should be understood that while both of the cooking appliances suggested in accordance with the above first and second aspect of the present invention individually solve the above object, a particularly preferred cooking appliance is configured to implement both these aspects.

[0017] When determining the temporal relationship of the placement of cookware onto the cooking surface, wherein it is determined when adjacent cooking zones are covered by cookware, the time span between such detections can be determined and compared to a predetermined minimum time. If it is determined that the placement of the cookware onto the adjacent cooking zones has been effected in a time period that is less or equal the predetermined minimum time, it is assumed that the cooking zones are to be operated in a bridging mode as a combined cooking zone.

[0018] Preferably the cooking appliance is configured to operate the user interface such that based on the decision whether the cooking zones are to be operated individually or are to be operated as a combined cooking zone, the user interface presents either individual input means for individually selecting a power level for each of the cooking zones, or presents a combined input means for selecting a power level for the combined cooking zone.

[0019] In a cooking appliance which embodies the above second aspect of the present invention, the user interface can be configured to present an input element for confirming the decision that has been made by the cooking appliance based on determining the temporal relationship of the placement of cookware. Thus, whereas the user interface, in dependency of the decision taken, may present respective input elements either for individual operation of the cooking zones or for a combined operation of adjacent cooking zones, such input elements may remain inactive until the decision taken by the cooking appliance is confirmed by the user.

[0020] Furthermore, to allow for a simultaneous operation of adjacent cooking zones for the heating of individual cookware items, for example when preparing similar dishes in individual cookware items, such as simul-

taneously heating two frying pans on adjacent cooking zones, the user interface may be configured to present, independently from the decision taken by the cookware detection, input means for selecting a bridging mode for adjacent cooking zones.

[0021] In any of the above embodiments, the cooking appliance can be configured such that if adjacent cooking zones are operated in a bridging mode, the bridging mode is maintained until the bridged cooking zones are switched off. That is, once a bridging mode has been selected, either by active choice of the user or based on an automated decision taken by the cooking appliance based on the cookware detection, the common operation of the respective cooking zones remains active until the bridged cooking zones are switched off, such as by turning the power level of the combined zone to zero, by switching off the combined zone either manually or by applying timer functions, or by turning off the cooking appliance.

[0022] In further embodiments the cooking appliance can be configured such that when it is detected that cookware is removed from a cooking zone, the respective cooking zone is switched off.

[0023] Similarly, the cooking appliance can be configured such that when it is detected that cookware is removed from a cooking zone which is operated in bridging mode, the bridging mode is terminated and the cooking zone from which cookware has been removed is switched off.

[0024] While in the above manner, the cooking appliance can be configured to prevent an unintended operation of a cooking zone after removal of the respective cookware item that has been heated in such cooking zone, so as to avoid unnecessary power consumption but also to avoid safety risks, the cooking appliance can be configured to wait, upon detection of removal of cookware from a cooking zone, with switching off the cooking zone or terminating the bridging mode. Thus, there can be implemented a certain delay time, so as to allow a temporary removal of the cookware item from the cooking zone, for example to allow the cookware item to be shortly lifted off without impacting the heating operation, such as to allow for stir-frying, decanting or the like.

[0025] Thus, in order to allow for a continued operation of the cooking zone or the combined cooking zone, the operation parameters, such as the power level and any timer functions applied, are temporarily stored until expiry of the delay time, whereupon such parameters are continued to be applied in case that it is detected that cookware again is present in the respective cooking zone. Should no cookware have been detected on expiry of the delay time, the respective function is turned off.

[0026] A cooking appliance as suggested herein usually is provided for conducting a cooking process which comprises at least one heating step of food, such as a baking, roasting, frying, boiling, steaming or braising. For this purpose, a food item or a volume of cooking liquid is put on a cooking surface of the appliance. It will be readily

understood that dependent of the type of food or cooking liquid to be heated, a cooking container or cookware item, e.g. a cooking vessel such as a pan or a pot, optionally closable with a lid, may be advantageously used.

[0027] For supporting the food or cookware item, it is known to provide a cooking support, for example in the form of a cooking surface in case of a hob. Such cooking surface provides a support for the cookware items in the form of more traditional pan supports, like the ones known from gas stoves, or in the form of a plate element, particularly a glass or glass ceramic plate.

[0028] For conducting the cooking process, the cooking appliance comprises power-transferring elements. Said power-transferring elements are provided for transferring power to the foodstuff or cooking liquid, which preferably is contained in a cookware item.

[0029] Such power transferring elements, may comprise heating power transferring elements to transfer heating power to the foodstuff or cooking liquid, particularly if contained in a cookware item. Such power transferring elements to transfer heating power particularly are useful to conduct a heating step of such cooking process.

[0030] The cooking appliance of the present invention comprises at least one energy power unit, particularly provided as a power board, preferably comprising a power generating circuit mounted on a printed circuit board (PCB). An energy power unit as used herein, preferably comprises at least one power generator for generating power and supplying power-transferring elements with power. Particularly, a cooking appliance in the form of a cooking hob may comprise at least one heating energy power unit, particularly provided as a power board, preferably comprising a heating power generating circuit mounted on a printed circuit board (PCB). An energy power unit as used herein preferably comprises at least one heating power generator for generating heating power and supplying heating power transferring elements with heating power. In preferred embodiments of the hob suggested herein, there are provided two coils per power board, which coils selectively can be bridged or can be operated independently. However, as explained herein, also more than two coils can be bridged to form to a combined zone, and alternatively or additionally two or more than two coils can be bridged that are supported by more than one power board.

[0031] The heating power may be provided particularly by heat, more particularly heat radiation. Alternatively or additionally, the heating power may be provided by heat generating power, particularly a heat generating magnetic field, more particularly an induction field. Accordingly, the cooking appliance preferably is a cooking hob, more preferably an induction hob.

[0032] In one particular embodiment of the present invention, the cooking appliance, particularly a cooking hob, more particularly an induction hob, comprises at least two heating zones. Such heating zones referred to herein, preferably refer to a portion of the cooking sup-

port, which is associated with a certain number, particularly one or two heating power transferring elements, e.g. a radiant heating element or an induction coil in case of a cooking hob. Particularly, in case of the cooking appliance being a cooking hob, particularly an induction hob, such heating zone as referred to herein, preferably refers to a portion of the cooking surface, which is associated with one heating power transferring element, e.g. a radiant heating element or an induction coil, which is arranged below the cooking surface, e.g. the glass ceramic plate. In other words, a heating zone preferably refers to a portion of the cooking surface in which heating power of one or two associated heating power transferring element is transferred to the foodstuff or cookware item, and, preferably may only be driven by the same power or heating level.

[0033] The cooking surface may comprise more than two cooking zones, each comprising one or more heating zones. For example, a cooking zone may be provided which comprises two or more than two, particularly, three concentrically arranged coils.

[0034] In another example, a cooking zone may be provided by at least two, preferably more than two, more preferably a plurality of, adjacently arranged heating zones, such as an array or a matrix of heating power transferring elements which are provided below a glass plate which forms the cooking plate.

[0035] Particularly, the heating zones may be combined to one or more cooking zones, in a predetermined and fixed or flexible manner. For example, a hob may comprise two heating zones, which form one or two cooking zones, wherein each heating zone can be driven with the same or a different heating or power level. For example, more than two, or more than three, particularly four heating zones may be arranged in a row, and form one or more cooking zones. Particularly, heating zones of said row may form one cooking zone or cooking sub zone. In a further example, an array of heating zones can be provided as a two-dimensional matrix of heating power transferring elements. In such case a number of adjacent heating power transferring elements, thus heating zones, particularly two, more than two, three, more than three, four or more than four may form one or more cooking zones respectively.

[0036] Thereby it should be understood that in one operation mode, each heating zone of a respective cooking zone is supplied with the same heating power, and can be controlled independent from any other cooking or heating zone. In a second operation mode, at least two heating zones are bridged to form a common cooking zone. Thereby, the bridged heating zones can be driven with the same heating power level, wherein only a single user input is required to select the power level for all of the bridged heating zones.

[0037] Such heating power transferring elements are usually arranged and/or mounted on a heating power transferring element carrier or heating power transferring element support. Particularly in the field of cooking hobs,

the heating power transferring elements (e.g. induction coils or radiation heaters) are supported by a carrier made of aluminum sheet metal. Particularly, whereas it is known to provide one coil carrier to support one induction coil, it also is considered herein that one coil carrier is provided to support more than one induction coil.

[0038] The particularly preferred embodiment of the present invention considers that said two heating power transfer elements are arranged on and supported by one common heating power transfer element carrier, such as an induction coil carrier plate.

[0039] The hob, preferably induction hob, according to the present invention preferably comprises energy power units for transferring heating power to each of the heating zones. In the present invention it is preferred that all heating power transfer elements, which are arranged on and supported by a common heating power transfer element carrier (i.e. induction coil carrier plate), are driven by the same energy power unit.

[0040] A cooking zone comprises preferably at least one heating zone, more preferably at least two, still more preferably at least three heating zones. Additionally, or alternatively, the hob may be configured such that the number of heating zones associated with one cooking zone may vary in dependency of the needs of the cook and/or the size, form or kind of cookware placed on the cooking surface.

[0041] As mentioned above, the energy power unit comprises preferably at least one generator for providing heating power to the at least one heating zone. The heating power may be provided, particularly by heat, more particularly by heat radiation. Alternatively or additionally, the heating power may be provided by heat generating power, particularly a heat generating magnetic field, more particularly an induction field. Accordingly, the cooking hob of the present invention preferably is an induction hob.

[0042] Particularly, the energy power unit may be supported and arranged in a housing, preferably a plastic housing. This allows easy manufacturing and modularization.

[0043] The energy power unit, and particularly the associated power circuit unit may be configured to be connected to at least one, preferably two phases of a mains supply. Thereby the energy power unit may particularly be provided in the form of a half-bridge configuration and/or a quasi-resonant configuration.

[0044] According to the present invention the inventive appliance comprises at least one control unit for controlling the energy power units. Particularly, the control unit is configured to assign a pre-determined and/or adjustable heating power level to the power generating circuit and as a result the heating power transfer elements may be supplied with the respectively assigned heating power.

[0045] The control unit further is connected, optionally via control means, with the user interface, by means of which the user can provide various inputs, such as select

power or temperature levels for individual heating or cooking zones, or select further program options such as timer functions, automated cooking functions and the like. The user interface employed herein further is used for displaying the various operation parameters and program options of the cooking appliance.

[0046] In preferred embodiments the user interface is a touchscreen element which provides for display and input functions in one and the same area of the user interface, wherein the parameters and available functions are adaptively presented to the user in dependency of the present state of the cooking process and the selections made by the user.

[0047] As noted above, the present invention further provides for methods for operating a cooking appliance, wherein the cooking appliance comprises a plurality of cooking zones, means for detecting whether cookware is present in the cooking zones, and a user interface for setting a power level for each of the cooking zones and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone. Thus, in accordance with an aspect of the present invention the method comprises detecting upon power-up of the cooking appliance whether cookware is present in the cooking zones, and if it is detected that cookware is present in at least two adjacent cooking zones, presenting input means for individually selecting a power level for each of the adjacent cooking zones, and further presenting input means for selecting a bridging mode for operating adjacent cooking zones as a combined cooking zone.

[0048] In a further aspect of the present invention the method comprises detecting during operation of the cooking appliance when cookware is placed onto at least two adjacent cooking zones, and determining the temporal relationship of the placement of cookware onto adjacent cooking zones so as to render a decision whether the cooking zones are to be operated individually or are to be operated in a bridging mode as a combined cooking zone.

[0049] Similarly as was the case for the individual aspects of the invention as related to the apparatus claims, in accordance with the present invention a method can comprise one or both of the above method aspects.

[0050] Preferred embodiments of the methods defined in claims 13 and 16 are defined in the dependent method claims.

[0051] Preferred embodiments of the present invention are described below by reference to the drawings, in which:

FIG 1 illustrates a schematic top view of a cooking hob according to the present invention,

FIG 2 is a schematic top view of the induction cooking hob of Fig. 1 which additionally illustrates various examples of arranging cookware items on the hob.

FIG 3 is a schematic top view of the induction cooking hob of Fig. 1 which illustrates an embodiment with six circular induction coils.

[0052] FIG 1 illustrates a schematic top view of a cooking hob 10 according to the present invention. Cooking hob 10 is designed as an induction hob which includes a number of induction coils 12. Whereas the concept suggested herein is not restricted to any particular type of hob and thus could be implemented in any kind of hob, it can be implemented in a particularly advantageous manner in an induction hob, because in an induction hob no separate sensors are required to provide for pot detection, but instead the induction coils used to supply the heating energy to the cooking zones can also be used to implement a pot detection function, such as by measuring inductivity or capacity of an induction coil, which parameters change when a pot is set to overlay the induction coil.

[0053] For this purpose, the appliance of the present invention comprises a respective cookware recognition means which implements a cookware recognition algorithm. Particularly, when the cooking appliance is an induction hob, such cookware recognition algorithm and respective cookware recognition means may be provided such that the control unit may induce a certain amount of inductivity in an induction coil and then determine whether an inductive coupling with cookware placed on top of the cooking surface is detected.

[0054] In the example shown in Figs. 1, 2 and 3, the induction cooking hob 10 includes six or twelve induction coils 12, respectively. Further, the induction cooking hob 10 comprises at least one user interface 14 by means of which various operational parameters and functions are displayed and can be selected. In the embodiment shown in Figs 1 and 2, each induction coil 12 is formed as a horizontal triangular disc having the shape of a right-angled triangle the corners of which are rounded. In the embodiment shown in Fig 3, each induction coil 12 is formed as a circular coil having round shape. Other shapes of coils are also known in the art, particularly oval coils or partially oval, D-shaped coils and the like, which are readily applicable within the scope of the present invention. The induction coils 12 are arranged in such a way that substantially the complete surface of the induction cooking hob 10 is covered by the induction coils 12 except for the surface region in which the user interface 14 is provided.

[0055] The induction coils 12 are arranged in such a way that each coil 12, particularly each pair of neighboring induction coils 12 may form a cooking zone.

[0056] Regarding the embodiment shown in Figs. 1 and 2 neighboring coils, which covers a rectangular or square area wherein the hypotenuses of each pair of neighboring induction coils 12 are arranged side-by-side and extend parallel to each other. Thus, the six pairs of induction coils 12 are arranged on the induction cooking hob 10 so as to form a three-by-two matrix of cooking

zones. Other cooking zones 30 can be formed, particularly by a pair of two horizontally or vertically neighbored coils as depicted in Fig. 3. More particularly, a cooking zone 28 may be also formed by more than two coils, e.g. four coils in a row (see e.g. Fig. 1) or column, or square (see Fig. 3).

[0057] Note that while for the purposes of the present invention each of the induction coils 12 of a hob 10 could be regarded as a "cooking zone", in the following description the present invention is described by reference to an embodiment in which the cooking zones are formed by the above mentioned pairs of induction coils 12, or cooking zones comprising more than one coil 12. That is, while in a standard or default operation mode any of the pairs of induction coils 12 is operated as a cooking zone of substantially elliptical, substantially rectangular or substantially square shape, in certain circumstances one or more of these cooking zones can be operated in a split mode, in which only one of the respective pair of induction coils 12 is operated, such as for heating smaller vessels, such as small round cooking vessel 16 shown in Fig. 2, or in order to provide for a cooking zone the shape of which cannot be implemented by combining any of the square cooking zones, such as for heating large-sized circular cooking vessel 20 for which several cooking zones that are operated in split mode are operated in a bridging mode. Regarding Fig. 3, it can be readily understood that on one single coil 12 a standard pot or pan may be placed and heated, whereas a cooking zone comprising a pair of coils 12 provides a cooking surface for a larger more elongate cooking vessel, like a plancha, roasting pan, or the like. In addition, other combinations of coils 12 for providing cooking zones may be advantageously considered within the scope of the invention, particularly comprising more than two coils, particularly four coils. Such cooking zones 28 or 30 comprise more than two coils and advantageously provide for cooking surfaces and cooking zones adapted for larger cooking vessels, particularly having larger diameter in at least one direction.

[0058] Preferably, each induction coil 12 is driven by one induction generator. Alternatively, two of the induction coils 12 may be connected in a serial or a parallel way, wherein the induction coils 12 may be switched by relays, triacs or IGBTs (insulated-gate bipolar transistors). In preferred embodiments, the induction coils 12 are driven by synchronized induction generators in order to avoid interference noise between the different induction coils 12.

[0059] In the embodiment shown in Fig. 1, the at least one user interface 14 is arranged in a front portion of the induction cooking hob 10. The at least one user interface 14 may be adapted to allow separate control of each or a number of the induction coils 12 but also allows two or more adjacent induction coils 12 and similarly two or more adjacent cooking zones to be operated simultaneously as a combined zone, as is further explained by reference to Fig. 2.

[0060] FIG 2 illustrates a schematic top view of the induction cooking hob 10 shown in Fig. 1, wherein Fig. 2 additionally shows several possible arrangements of cookware items, such as cooking pots or pans, of different size and shape.

[0061] Thus, as shown in Fig. 2, a small-sized circular cooking vessel 16 is arranged above a single induction coil 12 in the rear left corner of the induction cooking hob 10. The area of the small-sized circular cooking vessel 16 extends within the area of the corresponding induction coil 12.

[0062] Further, a medium-sized circular cooking vessel 18 may be arranged above two induction coils 12 in the front left corner of the induction cooking hob 10. The area of the medium-sized circular cooking vessel 18 extends within the area of the two induction coils 12 which together form the rectangular or square lower left cooking zone of the three-by-two matrix of cooking zones.

[0063] As noted above, a large-sized circular cooking vessel 20 may be arranged above four induction coils 12, as is illustrated in a central portion on the left hand side of the induction cooking hob 10. The four induction coils 12 below the large-sized circular cooking vessel 20 form a rectangular or square area, wherein said rectangular or square area is arranged diagonally with respect to the surface of the induction cooking hob 10. The four induction coils 12 below the large-sized circular cooking vessel 20 belong to four different pairs of induction coils 12, i.e. belong to four different cooking zones each of which is operated in split mode.

[0064] Furthermore, Fig. 2 illustrates a first rectangular cooking vessel 22 which is arranged above four induction coils 12 in the rear corner on the right hand side of the induction cooking hob 10. Said four induction coils 12 belong to two neighboring pairs of induction coils 12 in the rear region of the induction cooking hob 10. A second rectangular cooking vessel 24 is shown to be arranged upon four induction coils 12 on the right hand side of the induction cooking hob 10. Again, said four induction coils 12 belong to two neighboring pairs of induction coils 12.

[0065] From the examples shown in Fig. 2, it should be evident that there are various further options of combining two or more individual inductions coils or a plurality of individual cooking zones into a larger combined cooking zone. Further, while in the embodiment shown in Figs. 1 and 2, a cooking zone may be formed by a pair of two of the triangular shaped coils, as is evident from the examples shown, a cooking zone may comprise a single coil (such as for heating small circular cooking vessel 16) or may comprise more than two coils (such as for heating the large-sized circular cooking vessel 20). That is, while any such zone could be termed a "cooking zone", from the perspective of the user, the cooking zones may be zones that are marked, such as by printing, on the surface of the hob, such as the six square zones mentioned above in the description of Fig. 1.

[0066] In a preferred embodiment, the appliance comprises a main switch 26 for switching ON or OFF the

appliance.

[0067] Starting from a state when the appliance is in OFF mode, the user may place a cookware item on the cooking surface, i.e. above any of the induction coils 12. For example, when a cookware is placed on the cooking surface so as to cover the surface area of the second rectangular cooking vessel 24 marked in Fig. 2, upon powering ON the appliance a cookware detection algorithm is initiated in which it is determined that the four inductions coils in the right portion of the cooking surface, i.e. the front right cooking zone 28 and the rear right cooking zone 30 (see Fig. 1), are covered. In such a state the user interface 14 presents means for individually selecting a power level for each of cooking zones 28 and 30, and further presents input means for selecting a bridging mode for operating cooking zones 28 and 30 as a combined cooking zone. Such input means for selecting a bridging mode can be for example a button or a bridging symbol which is displayed on user interface 14, for example between respective icons for cooking zones 28 and 30.

[0068] If the user selects the bridging mode for cooking zones 28 and 30, the user interface 14 changes its appearance by hiding the input elements for individually selecting a power level for cooking zones 28 and 30, and instead presents a single input means for selecting a power level of the combined cooking zone. When the bridging mode has been selected, also the bridging symbol no longer is required and hence can be hidden. Once a bridging mode has been selected, the respective cooking zones that constitute the combined cooking zone cannot be de-bridged. Thus, in case that the bridging mode is to be terminated, the power level of the combined zone has to be set to zero. In case that the power level is set to zero the bridge icon is made visible again, and upon touching the bridge icon, the cooking zone can be de-bridged into two individual cooking zones, whereby separate input elements for individually and independently selecting power levels for cooking zones 28 and 30 again are made visible or are activated.

[0069] In a further operating mode, when the hob is ON, the pot recognition algorithm is initiated as soon as a cookware item is placed on the cooking plate which covers the inductions coils 12. With the pot recognition algorithm being initiated each time when a cookware item is placed on the cooking plate, when it is detected that two cooking zones are covered, the pot recognition algorithm determines whether the two cooking zones were covered at the same time, or substantially at the same time, i.e. within a predetermined time period.

[0070] If it is determined that more than one cooking zone is covered at the same time, or substantially at the same time, the control unit assumes that these cooking zones are covered by the same cookware item. In such case the covered cooking zones are automatically bridged to constitute a single combined cooking zone. Thus, based on the decision taken as a result of the pot recognition algorithm, a single input element for selecting

the power level of the combined zone is presented at the user interface 14. If desired, a further input element can be presented, by which the decision suggested by the pot recognition algorithm is to be confirmed, wherein the input element for selecting the power level of the combined zone is activated only upon a confirmation having been made.

[0071] The hob further can be configured such that when it is detected that cookware is removed from a cooking zone, the respective cooking zone is switched off. Similarly, the hob can be configured such that when it is detected that cookware is removed from a cooking zone which is operated in bridging mode, the bridging mode is terminated and the cooking zone from which cookware has been removed is switched off. In alternative embodiments, upon detecting the removal of cookware from at least one of the bridged cooking zones, the user interface 14 can present a respective message or icon, wherein further an input element for terminating the bridge mode may be presented.

[0072] When detecting a removal of cookware from a cooking zone, further action such as terminating the bridging mode or turning off a cooking zone, can be delayed for a predetermined time interval, which preferably is within a range of from 30 seconds to 3 minutes, such as 2 minutes. If within such time interval it is detected that cookware is again present in the respective cooking zone the operation of the cooking zone is continued in the same manner as before detecting the removal of cookware. Thus, the selected operating parameters are temporarily stored until expiry of the delay period, upon which operation either is continued with these operating parameters, or the respective mode is terminated and the temporarily stored operating parameters are discarded.

Claims

1. A cooking appliance comprising:

- a plurality of cooking zones (12; 28, 30);
- means for detecting whether cookware is present in the cooking zones;
- at least one user interface (14) for setting a power level for each of the cooking zones (12; 28, 30), and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone;

characterized in that the cooking appliance is configured to detect upon power-up of the cooking appliance whether cookware is present in the cooking zones (12; 28, 30), and if it is detected that cookware is present in at least two adjacent cooking zones, the user interface (14) presents input means for individually selecting a power level for each of the adjacent cooking zones, and further presents input

means for selecting a bridging mode for operating adjacent cooking zones as a combined cooking zone.

2. The cooking appliance of claim 1, which is configured to operate the at least one user interface (14) such that upon selection of a bridging mode of adjacent cooking zones (12; 28, 30), the input means for individually selecting a power level for each of the adjacent cooking zones are hidden, and that input means for selecting a power level of the combined cooking zone is presented.
3. The cooking appliance of claim 1 or 2, which is configured to operate the at least one user interface (14) such that upon selection of a bridging mode of adjacent cooking zones (12; 28, 30), the input means for selecting a bridging mode is hidden for those cooking zones for which a bridging mode has been selected.
4. A cooking appliance comprising:
 - a plurality of cooking zones (12; 28, 30);
 - means for detecting whether cookware is present in the cooking zones;
 - at least one user interface (14) for setting a power level for each of the cooking zones, and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone;

characterized in that the cooking appliance is configured to detect during operation of the cooking appliance when cookware is placed onto at least two adjacent cooking zones (12; 28, 30), wherein based on the temporal relationship of the placement of cookware onto adjacent cooking zones a decision is made whether the cooking zones are to be operated individually or are to be operated in a bridging mode as a combined cooking zone.

5. The cooking appliance of claim 4, in which a decision is made that the cooking zones (12; 28, 30) are to be operated as a combined cooking zone, if the placement of cookware in adjacent cooking zones is determined to have been effected in a time period that is less or equal a predetermined minimum time.
6. The cooking appliance of claim 4 or 5, which is configured to operate the at least one user interface (14) such that based on the decision whether the cooking zones (12; 28, 30) are to be operated individually or are to be operated as a combined cooking zone the user interface presents either individual input means for individually selecting a power level for each of the cooking zones, or presents a combined input means for selecting a power level for the combined

cooking zone.

7. The cooking appliance of any of the claims 4 to 6, in which the user interface (14) is configured to present an input element for confirming the decision.
8. The cooking appliance of any of the claims 4 to 7, in which the user interface (14) is configured to present, independently from the said decision, input means for selecting a bridging mode for adjacent cooking zones (12; 28, 30).
9. The cooking appliance of any of the preceding claims, which is configured such that if adjacent cooking zones (12; 28, 30) are operated in a bridging mode, the bridging mode is maintained until the bridged cooking zones are switched off.
10. The cooking appliance of any of the preceding claims, which is configured such that when it is detected that cookware is removed from a cooking zone (12; 28, 30), the respective cooking zone is switched off.
11. The cooking appliance of any of the preceding claims, which is configured such that when it is detected that cookware is removed from a cooking zone (12; 28, 30) which is operated in bridging mode, the bridging mode is terminated and the cooking zone from which cookware has been removed is switched off.
12. The cooking appliance of claim 10 or 11, in which upon detection of removal of cookware from a cooking zone (12; 28, 30) further action is delayed for a predetermined time interval, wherein if within such time interval it is detected that cookware is again present in the respective cooking zone the operation of the cooking zone is continued as before detecting the removal of cookware.
13. A method for operating a cooking appliance, the cooking appliance comprising:
 - a plurality of cooking zones (12; 28, 30);
 - means for detecting whether cookware is present in the cooking zones;
 - a user interface (14) for setting a power level for each of the cooking zones, and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone;
 the method comprising:
 - detecting upon power-up of the cooking appliance whether cookware is present in the cooking zones (12; 28, 30), and if it is detected that cookware is present in at least two adjacent cooking

- zones, presenting input means for individually selecting a power level for each of the adjacent cooking zones, and further presenting input means for selecting a bridging mode for operating adjacent cooking zones as a combined cooking zone.
- 14.** The method of claim 13, comprising, upon selection of a bridging mode of adjacent cooking zones (12; 28, 30): hiding the input means for individually selecting a power level for each of the adjacent cooking zones, and presenting input means for selecting a power level of the combined cooking zone.
- 15.** The method of claim 13 or 14, comprising, upon selection of a bridging mode of adjacent cooking zones (12; 28, 30): hiding the input means for selecting a bridging mode for the cooking zones for which a bridging mode has been selected.
- 16.** A method for operating a cooking appliance, the cooking appliance comprising:
- a plurality of cooking zones (12; 28, 30);
 - means for detecting whether cookware is present in the cooking zones;
 - a user interface (14) for setting a power level for each of the cooking zones, and for selecting whether at least two cooking zones are operated independently or as a combined cooking zone;
- the method comprising:
- detecting during operation of the cooking appliance when cookware is placed onto at least two adjacent cooking zones (12; 28, 30), and determining the temporal relationship of the placement of cookware onto adjacent cooking zones so as to render a decision whether the cooking zones are to be operated individually or are to be operated in a bridging mode as a combined cooking zone.
- 17.** The method of claim 16, in which a decision is made that the cooking zones (12; 28, 30) are to be operated as a combined cooking zone, if the placement of cookware in adjacent cooking zones is determined to have been effected in a time period that is less or equal a predetermined minimum time.
- 18.** The method of claim 16 or 17, in which based on the decision whether the cooking zones (12; 28, 30) are to be operated individually or are to be operated as a combined cooking zone the either individual input means for individually selecting a power level for each of the cooking zones are presented, or a combined input means for selecting a power level for the combined cooking zone is presented.
- 19.** The method of any of the claims 16 to 18, further comprising presenting an input element for the user to confirm the decision.
- 20.** The method of any of claims 13 to 19, in which if adjacent cooking zones (12; 28, 30) are operated in a bridging mode, the bridging mode is maintained until the bridged cooking zones are switched off.
- 21.** The method of any of claims 13 to 20, in which when it is detected that cookware is removed from a cooking zone (12; 28, 30), the respective cooking zone is switched off.
- 22.** The method of any of claims 13 to 21, in which when it is detected that cookware is removed from a cooking zone (12; 28, 30) which is operated in bridging mode, the bridging mode is terminated and the cooking zone from which cookware has been removed is switched off.
- 23.** The method of any of claims 13 to 22, in which upon detection of removal of cookware from a cooking zone (12; 28, 30) further action is delayed for a predetermined time interval, wherein if within such time interval it is detected that cookware is again present in the respective cooking zone the operation of the cooking zone is continued as before detecting the removal of cookware.

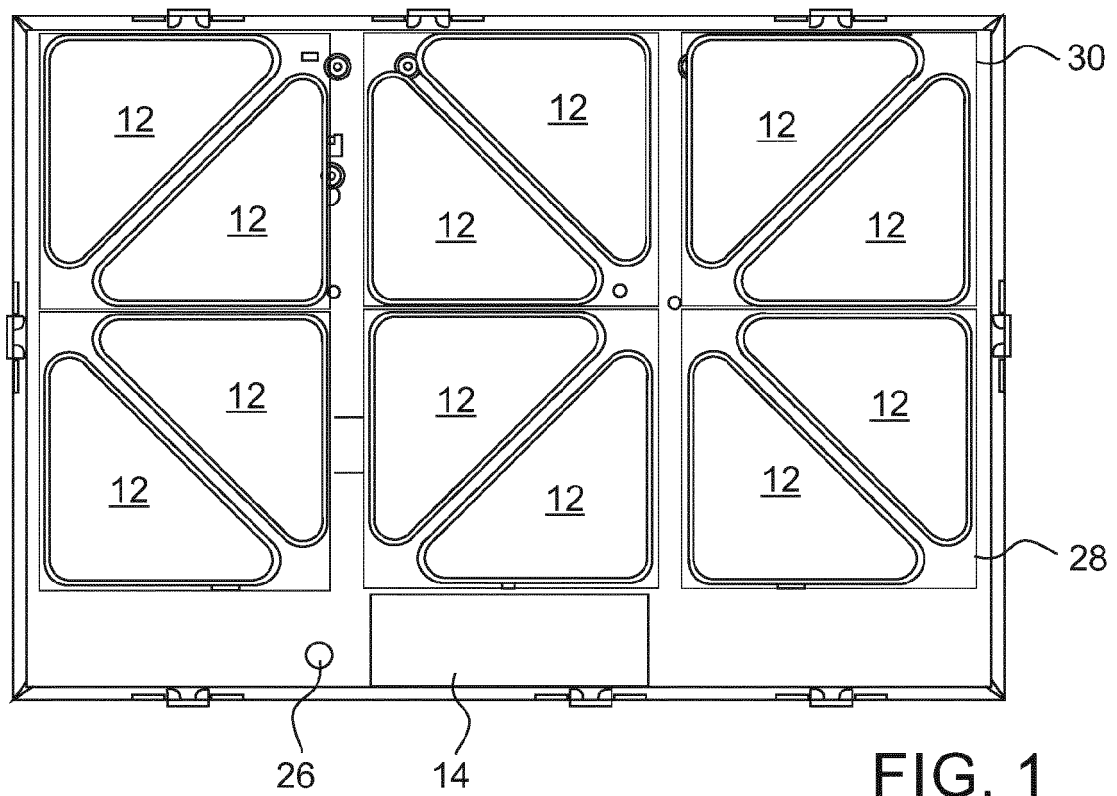


FIG. 1

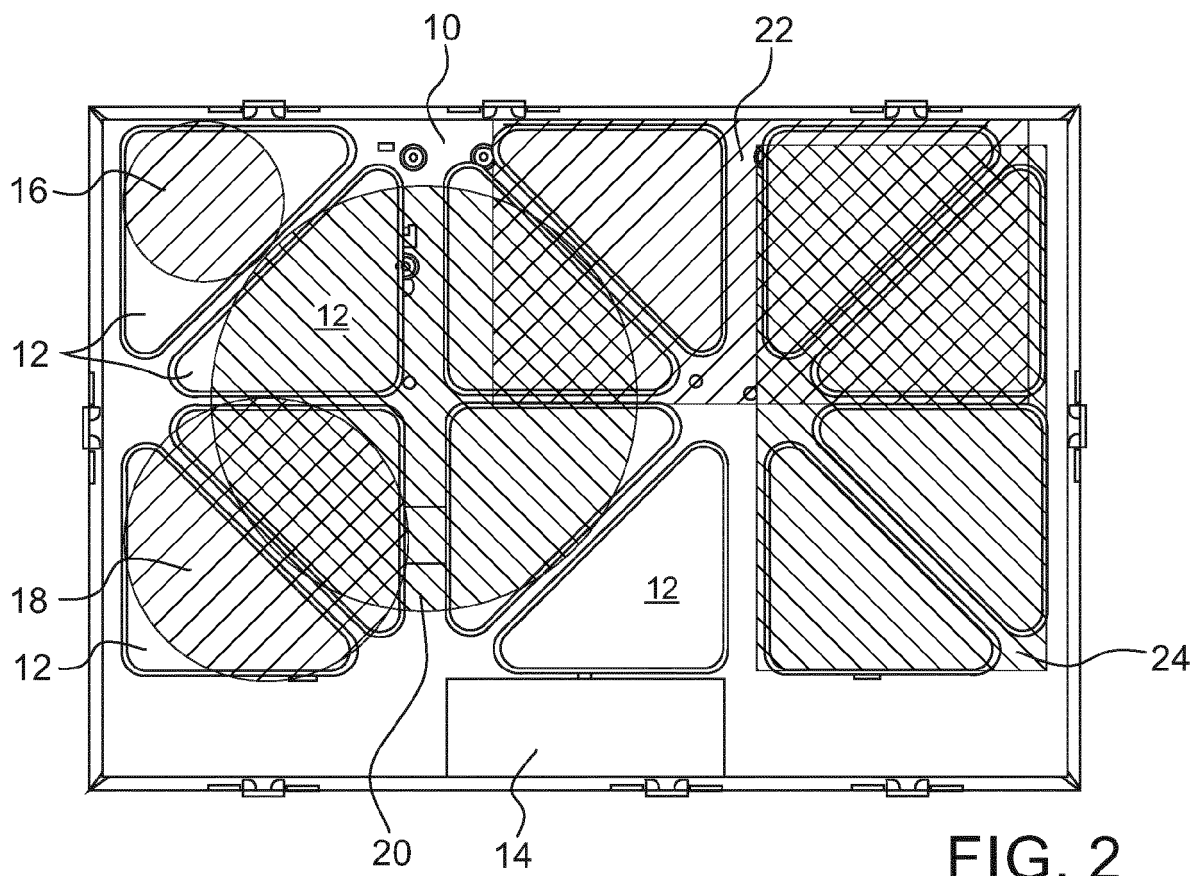


FIG. 2

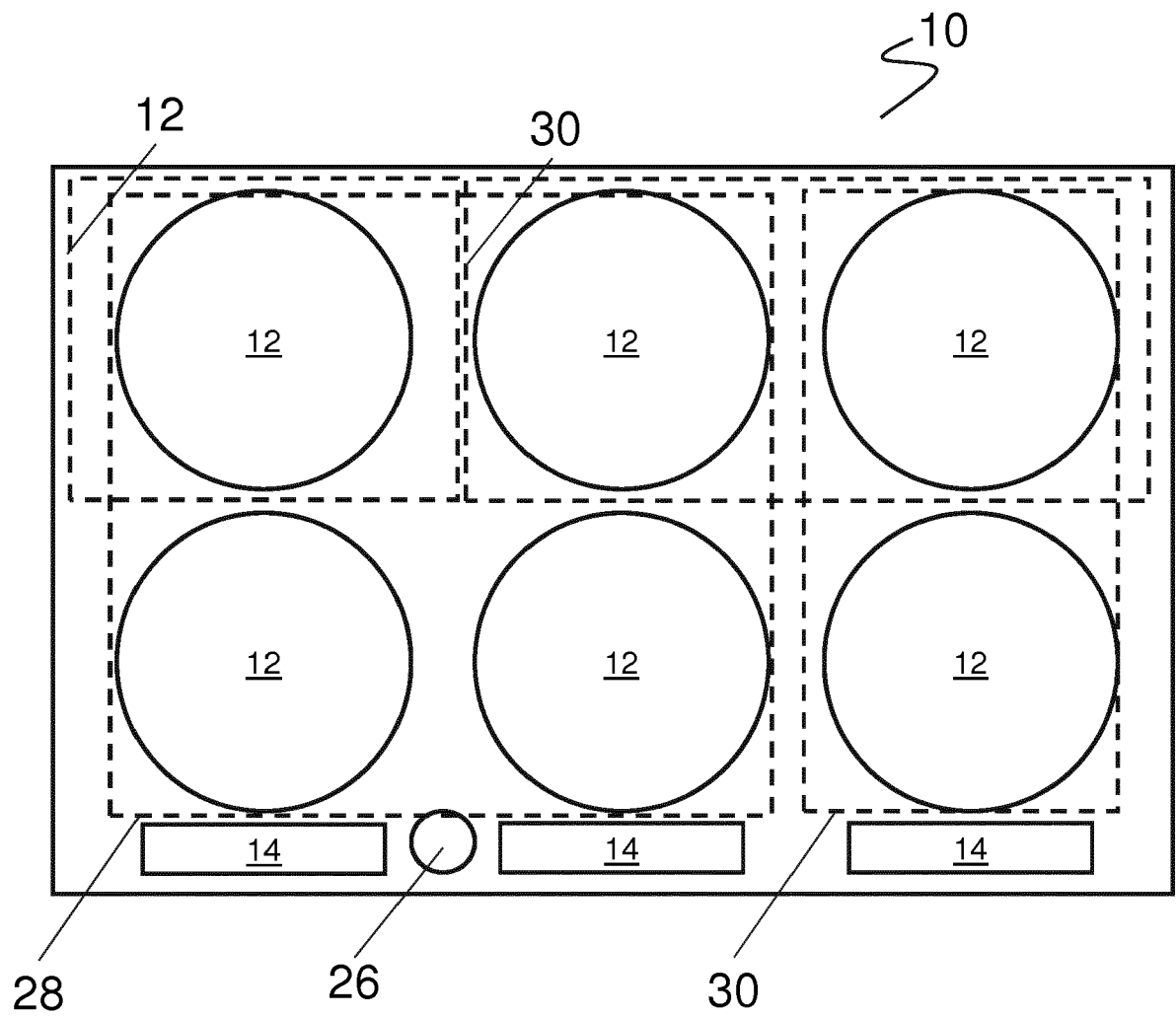


Fig. 3



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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 March 2018	Examiner Garcia, Jesus
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16-03-2018

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